FACT SHEET
Permeable Reactive Barrier Zones

Department of the Navy RAB/TRC Training Workshop

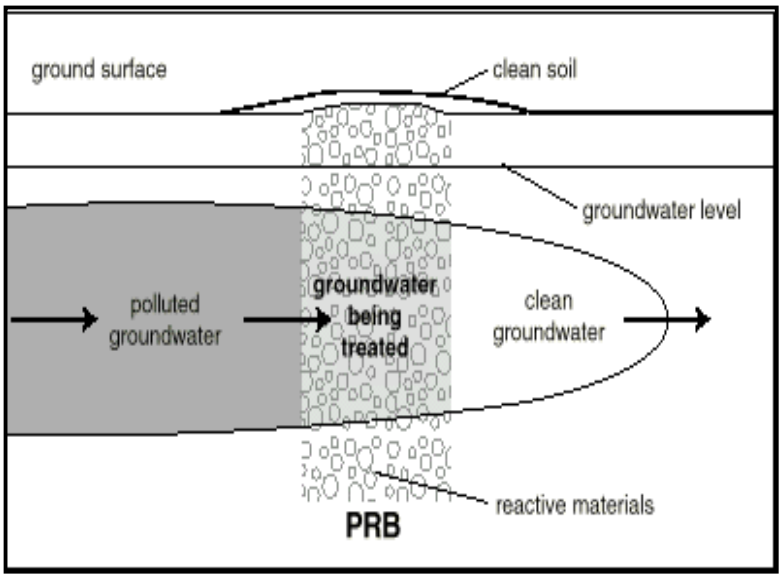
What are permeable reactive barrier zones?

Permeable reactive barriers (PRBs) are underground permeable walls with reactive material that degrades or immobilizes contaminants in groundwater flow. As contaminated water passes through the reactive zone of the permeable reactive barrier (PRB), the contaminants are either immobilized or chemically degraded to a more desirable (e.g., less toxic, more readily biodegradable, etc.) state. PRBs are installed as permanent, semi-permanent, or replaceable units across the ground water flow path of a contaminant plume. The barriers may contain reactants, nutrients, or oxygen depending on the contaminant.

PRBs can be installed in one of two basic ways: funnel-and-gate or trench. The funnel-and-gate system has impermeable walls that direct the contaminant plume through a gate containing the reactive media. A trench is installed across the entire path of the plume and is filled with the reactive media. In both cases the ground water is able to pass throught the media while the contaminant is collected.

Why use permeable reactive barrier zones?

Three important issues must be addressed before considering contaminant remediation through the use of PRB technology. First, the nature of the contaminant must be determined. Then, the availability of reactive media that can transform the contaminant, in ground, yet remain reactive in relatively long time periods must be identified. The third issue is determining the mobility, toxicity, and stability of the transformation products resulting from the contaminant and media interactions. If these transformation products are regulated compounds, they must not exit the reactive zone of the PRB without themselves being immobilized or transformed to innocuous compounds. For contaminants of unknown treatability or media of unknown reactivity, laboratory studies will be required.



Where has the Navy implemented PRBs?

At the Naval Weapons Industrial Reserve Plant in McGregor, Texas a biological PRB system was installed to abate offsite migration of perchlorate in 1999. The system consisted of trenches that were backfilled with permeable reactive material. The material included gravel, compost, vegetable oil, and cottonseed, which were carbon sources needed to assist perchlorate biodegradation. The results from the pilot system and the bench scale study indicated that perchlorate levels could be decreased from 27,000 parts per billion to 4 parts per billion in ground water.

Glossary:

Permeable – An item that can be penetrated, especially by liquids or gases.

Biodegradable – Capable of being decomposed by biological agents, especially bacteria.

Plume – A space in air, water, or soil containing pollutants released from a point source.

References:
- Navy. *DON Environmental Restoration SMART Cleanup For Future Generations Report.*
- NAVFAC. *Perchlorate Interim Measures,* NWIRP McGregor.
- EPA, RTDF. *Permeable Reactive Barrier Technology for Contaminant Remediation.*

For further information visit:
http://www.clu-in.org
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